

ULDB  
PDR

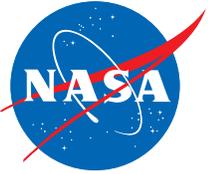
2.2.1  
Commandable  
Apex Package  
(CAP)

Steven M. Raqué  
Code 820  
November 4, 1998

## *HWCI 2.2.1*

# *Commandable Apex Package (CAP)*

- Requirements Traceability
  - DTRD Sections 2.2.1.1, 2.2.1.2
- Functional and Performance Requirements
  - 2.2.1.a - The CAP shall incorporate a vent valve
  - 2.2.1.b - Flow Rate not less than 0.042 kg/s at 30 mb
  - 2.2.1.c - Flow Rate not less than 0.008 kg/s at 5 mb
  - 2.2.1.d - Open/Close time of less than 10 s
  - 2.2.1.e - The CAP shall have an automatic valve control system capable of float acquisition and float pressure control
  - 2.2.1.f - The auto-control system shall be programmable to support all ULDB test flights
  - 2.2.1.g - The valve shall be manually controllable from the ground
  - 2.2.1.h - The CAP shall operate in the flight environment



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## *HWCI 2.2.1 CAP Verification Matrix*

Req. No.	Requirement	Verification Method
2.2.1.a	Vent Valve	Inspection
2.2.1.b	Flow Rate 1	Flow Tests, Test Flights
2.2.1.c	Flow Rate 2	Flow Tests, Test Flights
2.2.1.d	Open/Close Time	Timing Tests, Flight Tests
2.2.1.e	Auto Control	Demonstration, Simulation Tests, Flight Tests
2.2.1.f	Support Phase II-V Flights	Analysis, Demonstration
2.2.1.g	Manual Control	Demonstration
2.2.1.h	Flight Environment	Environmental Tests, Flight Tests



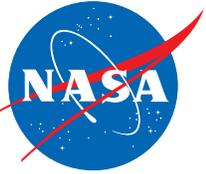
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## *Overall CAP Design*

- Repackaged LDBV system
  - Improved durability
  - Improved refurbishment
- WFF developed vent valve
  - 72.5 cm diameter footprint
  - Less than 11.5 kg
- NSBF developed controller
  - Single board programmable computer
  - Differential pressure transducer triad
  - Serial links for ULDB system and diagnostics
- WFF developed algorithm
  - Handles both ascent and float control

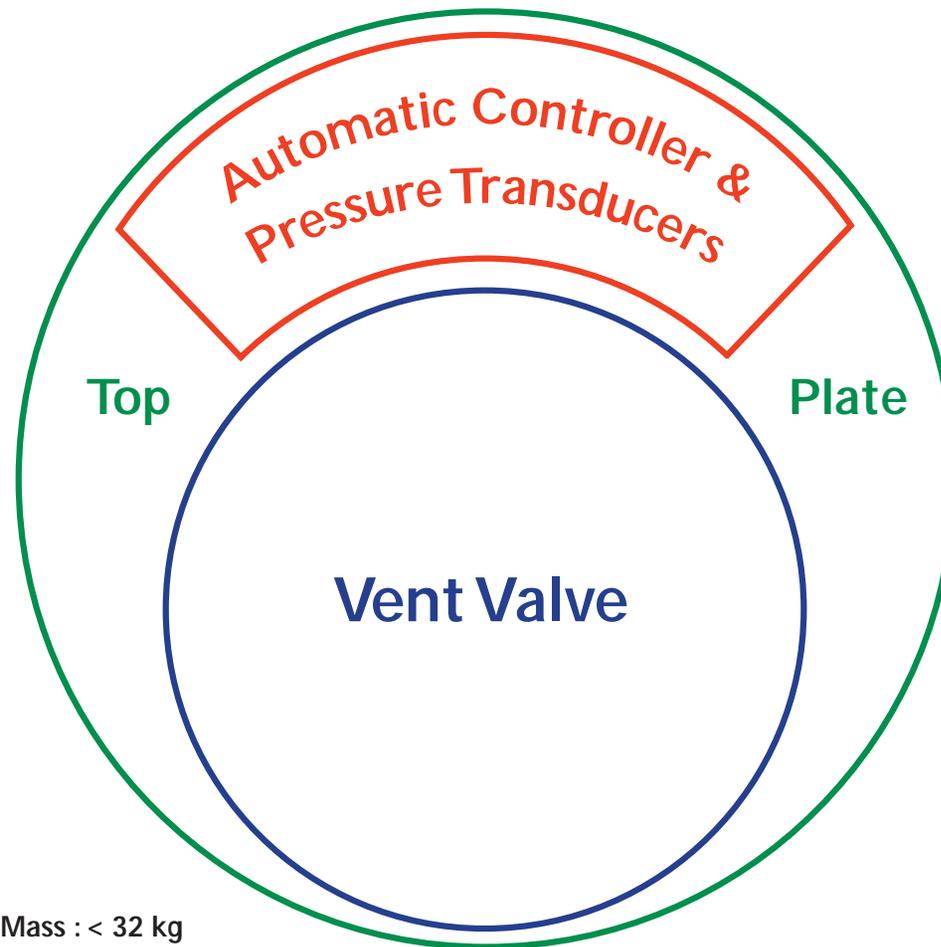


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# *HWCI 2.2.1 CAP Physical Layout*



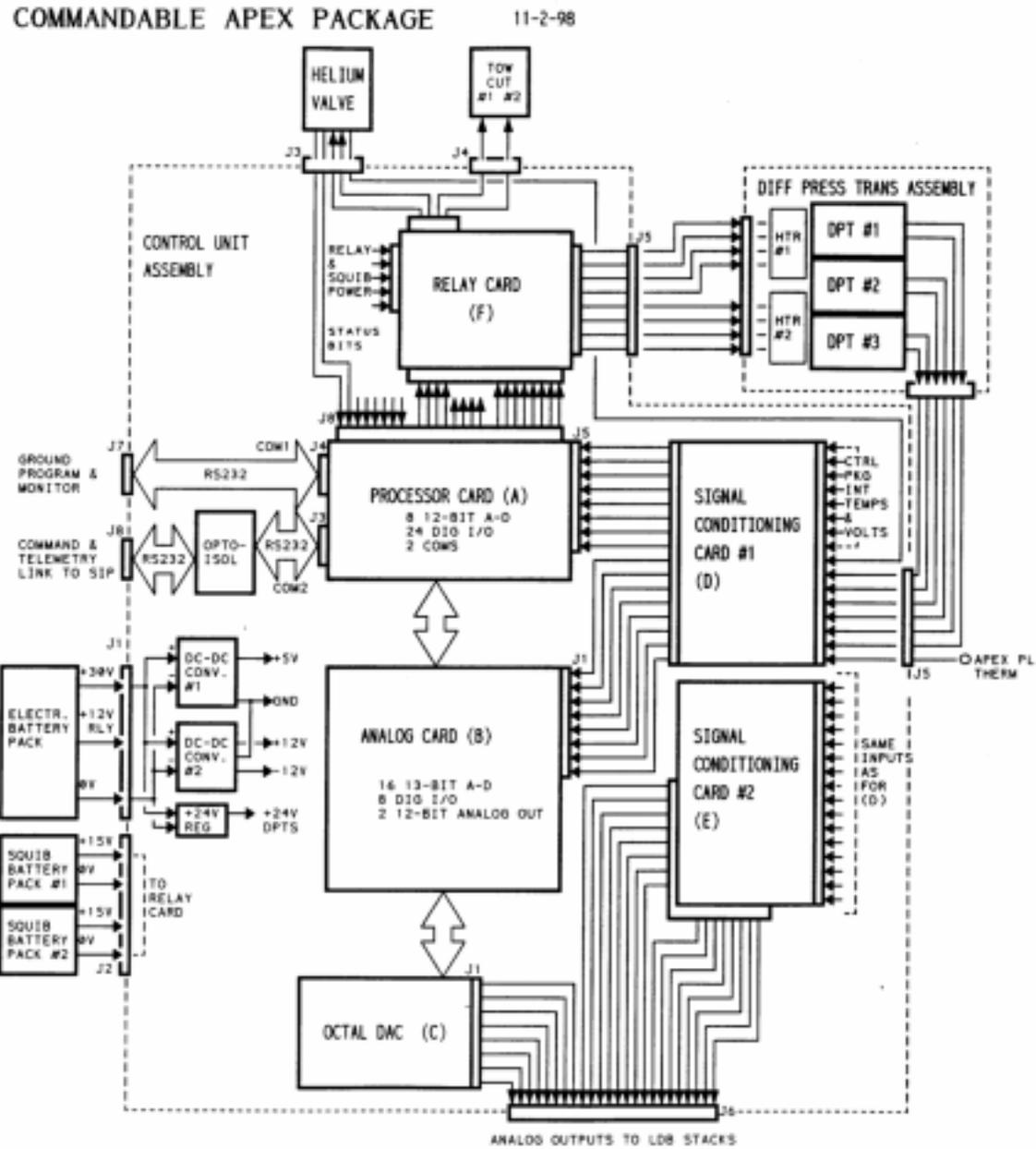
Total Mass : < 32 kg  
Total Power : < 6W continuous  
< 20W Peak (Motor & Heaters)



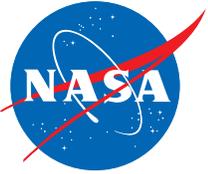
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## *HWCI 2.2.1*

### *CAP Risk Assessment & Mitigation*

- Valve and controller have been endurance tested in Thermal Vacuum Chamber
  - Low Temperature Tests (-45°C & -65°C)
  - High Temperature Tests (25°C & 45°C)
  - 400 Open/Close cycles
- Valve and controller have been test flown 2 times successfully on short duration flights